Class IX Session 2024-25
Subject - Mathematics
Sample Question Paper - 6

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment carrying 04 marks each.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section A

1. $\sqrt[5]{6} \times \sqrt[5]{6}$ is equal to **[1]**

a) $\sqrt[5]{36}$ b) $\sqrt[5]{6}$

c) $\sqrt[5]{6 \times 0}$ d) $\sqrt[5]{12}$

2. For the equation 5x – 7y = 35, if y = 5, then the value of ‘x’ is **[1]**

a) 12 b) -12

c) -14 d) 14

3. Point (- 10,0) lies **[1]**

a) on the negative direction of the y-axis b) on the negative direction of the X-axis

c) in the third quadrant d) in the fourth quadrant

4. In a bar graph if 1 cm represents 30 km, then the length of bar needed to represent 75 km is **[1]**

a) 3.5 cm b) 2.5 cm

c) 2 cm d) 3 cm

5. The force applied on a body is directly proportional to the acceleration produced on it. The equation to represent the above statement is **[1]**

a) y = kx b) y = x

c) y + x = 0 d) y - x = 0

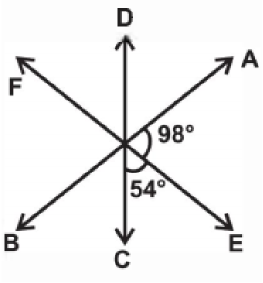
6. How many dimensions does a point have? **[1]**

a) 3 b) 2

c) 0 d) 1

7. In the figure AB, CD & EF are three Straight lines intersecting at O. **[1]**

The measure of $\angle AOF$ is-



a) 82° b) 152°

c) 54° d) 98°

8. ABCD is a trapezium in which AB || DC. M and N are the mid-points of AD and BC respectively. If AB = 12 cm, MN = 14 cm, then CD = **[1]**

a) 10 cm b) 14 cm

c) 12 cm d) 16 cm

9. The value of ‘a’ for which (x + a) is a factor of the polynomial $x^3 + ax^2 - 2x + a + 6$ is **[1]**

a) 0 b) 1

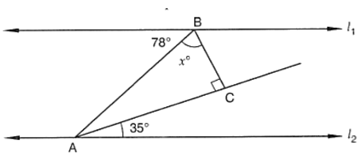
c) 2 d) -2

10. If we multiply both sides of a linear equation with a non-zero number, then the solution of the linear equation: **[1]**

a) Remains the same b) Changes in case of multiplication only

c) Changes in case of division only d) Changes

11. In figure, for which value of x is $l_1 \| l_2$? **[1]**



a) 43 b) 37

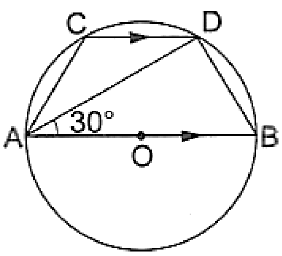
c) 45 d) 47

12. The figure formed by joining the mid-points of the adjacent sides of a rhombus is a **[1]**

a) trapezium b) rectangle

c) square d) Parallelogram

13. In the given figure, AOB is a diameter of a circle and CD || AB. If ∠BAD = 30°, then ∠CAD = ? **[1]**



a) 45°

b) 60°

c) 50°

d) 30°

14. The value of $\sqrt[4]{(64)^{-2}}$ is **[1]**

a) $\frac{1}{2}$

b) $\frac{1}{8}$

c) $\frac{1}{16}$

d) $\frac{1}{4}$

15. The equation of x-axis is **[1]**

a) y = 0

b) x = 0

c) y = k

d) x = k

16. In $\triangle$PQR, $\angle$R = $\angle$P and QR = 4 cm and PR = 5 cm. Then the length of PQ is **[1]**

a) 2.5 cm

b) 4 cm

c) 5 cm

d) 2 cm

17. The value of $\frac{(0.013)^3+(0.007)^3}{(0.013)^2-0.013\times0.007+(0.007)^2}$, is **[1]**

a) 0.0091

b) 0.02

c) 0.006

d) 0.00185

18. A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1cm and the height of the cone is equal to its radius. The volume of the solid is **[1]**

a) $\pi\ cm^3$

b) $4\pi\ cm^3$

c) $2\pi\ cm^3$

d) $3\pi\ cm^3$

19. **Assertion (A):** The sides of a triangle are in the ratio of 25 : 14 : 12 and its perimeter is 510 cm. Then the area of the triangle is 4449.08 cm^2. **[1]**

Reason (R): Perimeter of a triangle = a + b + c, where a, b, c are sides of a triangle.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) R is not the correct explanation of A.

d) A is false but R is true.

20. **Assertion (A):** The equation of 2x + 5 = 0 and 3x + y = 5 both have degree 1. **[1]**

Reason (R): The degree of a linear equation in two variables is 2.

a) Both A and R are true and R is the correct explanation of A.

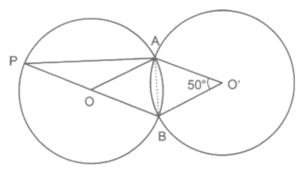
b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

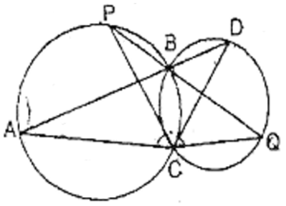
Section B

21. In a given figure, two congruent circles with centres O and O' intersect at A and B. If $\angle$AOB = 50°, then find $\angle$APB. **[2]**



22. Sides of a triangle are in the ratio of 12 : 17 : 25 and its perimeter is 540 cm. Find its area. **[2]**

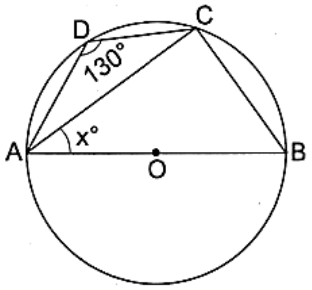
23. Two circles intersect at two points B and C. Through B, two line segments ABD and PBQ are drawn to intersect the circles at A, D, P, Q respectively (see figure). Prove that ACP = QCD. **[2]**



24. Find the length of a chord which is at a distance of 5 cm from the centre of a circle of radius 10 cm. **[2]**

OR

In the given figure, O is the centre of a circle and ∠ADC = 130°. If ∠BAC = x°, then find the value of x.



25. Find whether (2, 0) is the solution of the equation x – 2y = 4 or not? **[2]**

OR

Find whether the given equation have x = 2, y = 1 as a solution:

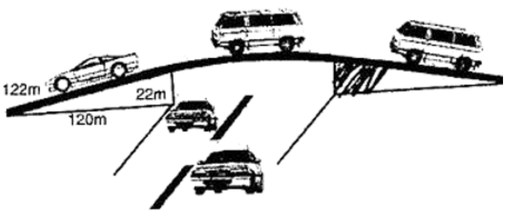
2x – 3y = 1

Section C

26. You know that $\frac{1}{7} = 0.\overline{142857}$. Can you predict what the decimal expansions of $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$ are, without actually doing the long division? If so, how? **[3]**

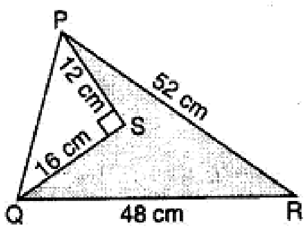
27. Find the value of the polynomial $3x^3 - 4x^2 + 7x + 5$, when x = 3 and also when x = - 3. **[3]**

28. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 122 m, 22 m and 120 m (see Fig.). The advertisements yield an earning of ₹ 5000 per m^2 per year. A company hired one of its walls for 3 months. How much rent did it pay? **[3]**



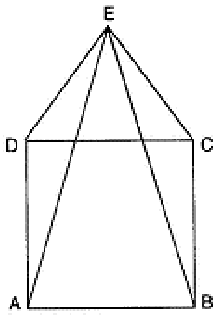
OR

Find the area of the shaded region in figure.



29. The internal and external diameters of a hollow hemispherical vessel are 20 cm and 28 cm respectively. Find the cost of painting the vessel all over at 35 paise per cm^2. **[3]**

30. ABCD is a square and DEC is an equilateral triangle. Prove that AE = BE. **[3]**



OR

BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that the triangle ABC is isosceles.

31. Draw the graphs of y = x and y = -x in the same graph. Also find the co-ordinates of the point where the two lines intersect. **[3]**

Section D

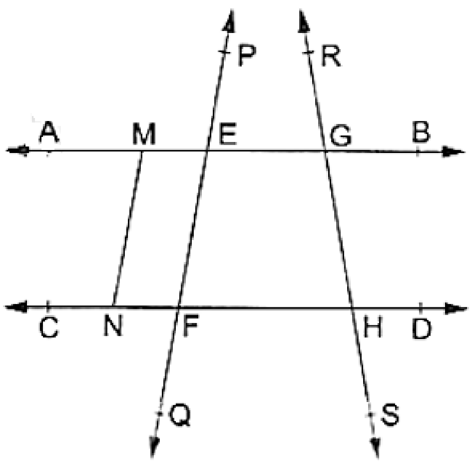
32. Represent each of the numbers $\sqrt{5}, \sqrt{6}$ and $\sqrt{7}$ the real line. **[5]**

OR

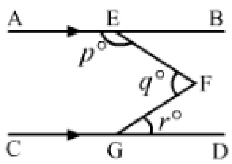
Simplify: $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$.

33. In the adjoining figure, name: **[5]**

i. Six points
ii. Five line segments
iii. Four rays
iv. Four lines
v. Four collinear points



34. In the given figure, AB || CD. Prove that p + q - r = 180. **[5]**



OR

If two lines intersect, prove that the vertically opposite angles are equal.

35. The following table gives the distribution of students of two sections according to the marks obtained by them: **[5]**

Section A		**Section B**	
Marks	Frequency	Marks	Frequency

0-10	3	0-10	5
10-20	9	10-20	19
20-30	17	20-30	15
30-40	12	30-40	10
40-50	9	40-50	1

Represent the marks of the students of both the sections on the same graph by frequency polygons. From the two polygons compare the performance of the two sections.

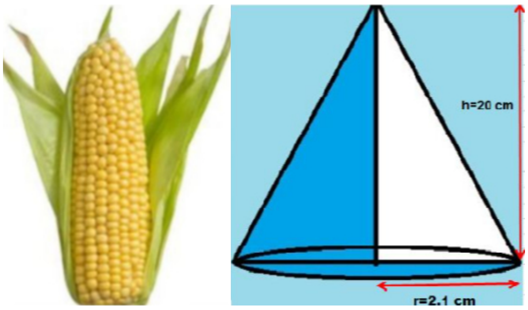
Section E

36. **Read the following text carefully and answer the questions that follow:** **[4]**

Once upon a time in Ghaziabad was a corn cob seller. During the lockdown period in the year 2020, his business was almost lost.

So, he started selling corn grains online through Amazon and Flipcart. Just to understand how many grains he will have from one corn cob, he started counting them.

Being a student of mathematics let's calculate it mathematically. Let's assume that one corn cob (see Fig.), shaped somewhat like a cone, has the radius of its broadest end as 2.1 cm and length as 20 cm.



i. Find the curved surface area of the corn cub. (1)
ii. What is the volume of the corn cub? (1)
iii. If each 1 cm^2 of the surface of the cob carries an average of four grains, find how many grains you would find on the entire cob? (2)

OR

How many such cubs can be stored in a cartoon of size 20 cm $\times$ 25 cm $\times$ 20 cm. (2)

37. **Read the following text carefully and answer the questions that follow:** **[4]**

Peter, Kevin James, Reeta and Veena were students of Class 9th B at Govt Sr Sec School, Sector 5, Gurgaon. Once the teacher told **Peter to think a number x and to Kevin to think another number y** so that the difference of the numbers is 10 (x > y).

Now the teacher asked James to add double of Peter's number and that three times of Kevin's number, the total was found 120.

Reeta just entered in the class, she did not know any number.

The teacher said Reeta to form the 1st equation with two variables x and y.

Now Veena just entered the class so the teacher told her to form 2nd equation with two variables x and y.

Now teacher Told Reeta to find the values of x and y. Peter and kelvin were told to verify the numbers x and y.

i. What are the equation formed by Reeta and Veena? (1)

ii. What was the equation formed by Veena? (1)

iii. Which number did Peter think? (2)

OR

Which number did Kelvin think? (2)

38. **Read the following text carefully and answer the questions that follow:** **[4]**

Harish makes a poster in the shape of a parallelogram on the topic SAVE ELECTRICITY for an inter-school competition as shown in the follow figure.

i. If $\angle A = (4x + 3)^o$ and $\angle D = (5x - 3)^o$, then find the measure of $\angle B$. (1)

ii. If $\angle B = (2y)^o$ and $\angle D = (3y - 6)^o$, then find the value of y. (1)

iii. If $\angle A = (2x - 3)^o$ and $\angle C = (4y + 2)^o$, then find how x and y relate. (2)

OR

If AB = (2y - 3) and CD = 5 cm then what is the value of y? (2)

Solution

Section A

1. **(a)** $\sqrt[5]{36}$
   Explanation: $\sqrt[5]{6} \times \sqrt[5]{6}$
   = $\sqrt[5]{6 \times 6}$
   =$\sqrt[5]{36}$

2. **(d)** 14
   Explanation: For the equation 5x – 7y = 35, if y = 5,
   $5x - 7y = 35$
   $y = 5$
   $5x - 7.5 = 35$
   $5x - 35 = 35$
   $5x = 35 + 35$
   $5x = 70$
   $x = \frac{70}{5} = 14$
   $x = 14$

3. **(b)** on the negative direction of the X-axis
   Explanation: In point (-10, 0) y-coordinate is zero, so it lies on X-axis and its x-coordinate is negative, so the point (-10, 0) lies on the X-axis in the negative direction.

4. **(b)** 2.5 cm
   Explanation: 1 cm = 30 km
   So for 75 km
   $\frac{75}{30}$ = 2.5 cm

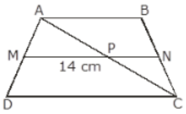
5. **(a)** y = kx
   Explanation: let force applied be y and accleration produced be x
   The force applied on a body is directly proportional to the acceleration produced on it.
   $y \alpha x$
   $y = kx$
   where k is proportionality constant

6. **(c)** 0
   Explanation: A point has 0 dimensions.

7. **(a)** 82°
   Explanation: 82°
   Clearly, $\angle DOF = \angle COE = 54 \quad \ldots$ (vertically opposite angles)
   Also,
   $\angle AOF + \angle AOE = 180$
   $\Rightarrow \angle AOF = 180 - \angle AOE$
   $\Rightarrow \angle AOF = 180 - 98$
   $\Rightarrow \angle AOF = 82$

8. **(d)** 16 cm
   Explanation:

Given,



ABCD is a trapezium

AB || DC

M, N are mid points of AD & BC

AB = 12 cm, MN = 14 cm

$\because$ AB || MN || CD [M, N are mid points of AD &BC]

MP = NP

By mid point theorem,

MP = $\frac{1}{2}$CD and NP = $\frac{1}{2}$AB

$\therefore$ MN = $\frac{1}{2}$(AB + CD)

$\Rightarrow$ 14 = $\frac{1}{2}$ (12 + CD)

$\Rightarrow$ CD = 28 - 12 = 16 cm

9.

(d) -2

Explanation: If (x + a) is a factor of the polynomial $x^3 + ax^2 - 2x + a + 6$, then

$p(-a) = 0$

=> $(-a)^3 + a(-a)^2 - 2(-a) + a + 6 = 0$

=> $-a^3 + a^3 + 2a + a + 6 = 0$

=> $3a = -6$

=> $a = -2$

10. **(a)** Remains the same

Explanation: If for any c. where c is any natural number

Like addition and subtraction we can multiply and divide both sides of an equation by a number, c, without changing the equation, where c is any natural number.

11.

(d) 47

Explanation: Let if $l_1 || l_2$ and AB is tranverse to it

Then,

$\angle$PBA should be equal to $\angle$BAS (Alternate angles)

So if $l_1 || l_2$, then $\angle$BAS = 70^o

$\Rightarrow \angle BAC$ = 78^o - 35^o = 43^o..(i)

Now, in $\triangle ABC$

x^o + $\angle$C + $\angle$BAC = 180^o

$\Rightarrow$ x^o + 90^o + 43^o = 180^o

$\Rightarrow$ x^o = 180^o - 90^o - 43^o = 47^o

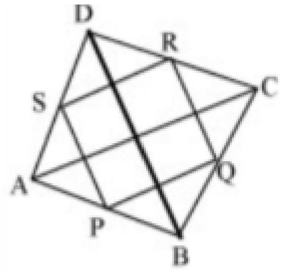
$\Rightarrow$ x^o = 47^o

So if x^o = 47^o then $l_1 || l_2$

12.

(b) rectangle

Explanation: rectangle



Let ABCD be a rhombus and P,Q,R and S be the mid-points of sides AB, BC, CD and DA respectively.
In △ABD and △BDC we have
SP ∥ BD and SP = $\frac{1}{2}$BD ..... (1) [By mid-point theorem]
RQ ∥ BD and RQ = $\frac{1}{2}$BD ..... (2) [By mid-point theorem]
From (1) and (2) we get,
SP ∥ RQ
PQRS is a parallelogram
As diagonals of a rhombus bisect each other at right angles.
∴ AC⊥BD
Since, SP ∥ BD, PQ ∥ AC and AC⊥BD
∴ SP⊥PQ
∴ ∠QPS = 90^o
∴ PQRS is a rectangle.

13.

(d) 30°
Explanation: ∠ADC = ∠BAD = 30° (Alternate angles)
∠ADB = 90° (Angle in semicircle)
∴ ∠CDB = (90° + 30°) = 120°
But ABCD being a cyclic quadrilateral, we have:
∠BAC + ∠CDB = 180°
⇒ ∠BAD + ∠CAD + ∠CDB = 180°
⇒ 30° + ∠CAD + 120° = 180°
⇒ ∠CAD = (180° - 150°) = 30°
⇒ ∠CAD = 30°

14.

(b) $\frac{1}{8}$
Explanation: $\sqrt[4]{(64)^{-2}}$
$\Rightarrow (64)^{\frac{-2}{4}}$
$\Rightarrow (64)^{\frac{-1}{2}}$ or $\frac{1}{\sqrt{64}}$
$\Rightarrow \frac{1}{8}$

15. **(a)** y = 0
Explanation: Since x-axis is a parallel to itself at a distance 0 from it. Let P (x,y) be any point on the x-axis. Then clearly, for all position of P, we shall have the same ordinate 0 or, y = 0. Therefore, the equation of x-axis is y = 0.

16.

(b) 4 cm
Explanation: In a triangle, if two of its angles are equal then the sides opposite to equal angles are also equal.
In △PQR, ∠R = ∠P
⇒ QR (side opposite to ∠P) = PQ (side opposite to ∠R)
Given that, QR = 4 cm
⇒ PQ = 4 cm

17.

(b) 0.02
Explanation: Assume a = 0.013 and b = 0.007. Then the given expression can be rewritten as

$\frac{a^3+b^3}{a^2-ab+b^2}$

Recall the formula for sum of two cubes

$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

Using the above formula, the expression becomes

$\frac{(a+b)\left(a^2-ab+b^2\right)}{a^2-ab+b^2}$

Note that both a and b are positive. So, neither $a^3 + b^3$ nor any factor of it can be zero.

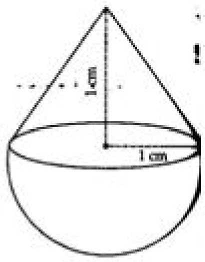
Therefore we can cancel the term $(a^2 - ab + b^2)$ from both numerator and denominator. Then the expression becomes

$\frac{(a+b)\left(a^2-ab+b^2\right)}{a^2-ab+b^2} = a + b$

= 0.013 + 0.007

= 0.02

18. **(a)** $\pi\ cm^3$

Explanation: 

Radii of cone = r = 1 cm

Radius of hemisphere = r = 1 cm (h) = 1cm

Height of cone $(h) = 1$ h =1 cm

Volume of solid = Volume of cone + Volume of a hemisphere

= $\frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$ = $\frac{1}{3}\pi r^2 (h + 2r)$

= $\frac{1}{3} \times \pi \times (1)^2 (1 + 2 \times 1)$

= $\frac{1}{3} \times \pi \times 3$ = π cm^3

19. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: 510 = a + b + c

510 = 25x + 14x + 12x

510 = 51x

x = 10

Three side of the triangle are

25x = 25 $\times$ 10 = 250 cm

14x = 14 $\times$ 10 = 140 cm and

12x = 12 $\times$ 10 = 120 cm

s = $\frac{250+140+120}{2}$ = 255 cm

Area = $\sqrt{255 \times 5 \times 115 \times 135}$

= 4449.08 cm^2

20.

(c) A is true but R is false.

Explanation: Every linear equation has degree 1.

2x + 5 = 0 and 3x + y = 5 are linear equations. So, both have degree 1.

Section B

21. As we are given that, both the triangle are congruent which means their corresponding angles are equal.

Therefore, $\angle$AOB = $\angle$AO'B = 50^o

Now, by degree measure theorem, we have

$\angle$APB = $\frac{\angle AOB}{2}$ = 50^o / 2 = 25^o

$\angle$APB = 25^o

22. Let the sides of the triangle be 12x, 17x and 25x

Therefore, 12x + 17x + 25x = 540

$\Rightarrow$ 54x = 540 $\Rightarrow$ x = 10

$\therefore$ The sides are 120 cm, 170 cm and 250 cm.

Semi-perimeter of triangle $s = \frac{120+170+250}{2}$ = 270 cm

Now, Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

= $\sqrt{270(270-120)(270-170)(270-250)}$

= $\sqrt{270 \times 150 \times 100 \times 20}$

= 9000cm^2

23. In triangles ACD and QCP,

$\angle$A = $\angle$P and $\angle$Q = $\angle$D [Angles in same segment]

$\therefore$ $\angle$ACD = $\angle$QCP [Third angles] ...(i)

Subtracting $\angle$PCD from both the sides of eq. (i), we get,

$\angle$ACD - $\angle$PCD = $\angle$QCP - $\angle$PCD

$\angle$ACP = $\angle$QCD

Hence proved.

24. Given that, Distance (OC) = 5 cm

Radius of circle (OA) = 10 cm

In $\triangle$OCA, by using Pythagoras theorem

AC^2 + OC^2 = OA^2

AC^2 + 5^2 = 10^2

AC^2 = 100 - 25

AC^2 = 75

AC = 8.66 cm

We know that,

The perpendicular from centre to chord bisects the chord

Therefore, AC = BC = 8.66 cm

Then, Chord AB = 8.66 + 8.66

= 17.32 cm.

OR

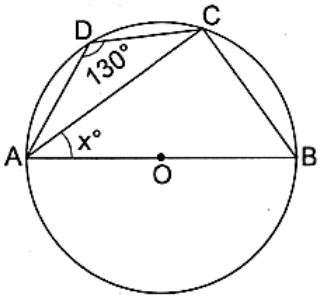
Since ABCD is a cyclic quadrilateral.

$\therefore$ $\angle$ADC + $\angle$ABC = 180°

$\Rightarrow$ 130° + $\angle$ABC = 180°

$\Rightarrow$ $\angle$ABC = 50^o

Since $\angle$ACB is the angle in a semi-circle.



$\therefore$ $\angle$ACB = 90^o

Using angle sum property in $\triangle$ ABC, we obtain

$\angle$BAC + $\angle$ACB + $\angle$ABC = 180°

$\Rightarrow$ $\angle$BAC + 90° + 50° = 180°

$\Rightarrow$ $\angle$BAC = 40°

25. x-2y=4

Put x = 2 and y = 0 in given equation, we get

x – 2y = 2 – 2(0) = 2 – 0 = 2, which is not 4.

$\therefore$ (2, 0) is not a solution of given equation.

OR

For x = 2, y = 1

L.H.S. = 2x – 3y

= 2(2) – 3(1)

= 4 – 3 = 1

= R.H.S.

∴ x = 2, y = 1 is a solution of 2x – 3y = 1.

Section C

26. Yes, We can predict the decimal expansions of $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$, without actually doing the long division as follows :

$\frac{2}{7} = 2 \times \frac{1}{7} = 2 \times 0.\overline{142857} = 0.\overline{285714}$

$\frac{3}{7} = 3 \times \frac{1}{7} = 3 \times 0.\overline{142857} = 0.\overline{428571}$

$\frac{4}{7} = 4 \times \frac{1}{7} = 4 \times 0.\overline{142857} = 0.\overline{571428}$

$\frac{5}{7} = 5 \times \frac{1}{7} = 5 \times 0.\overline{142857} = \overline{0.714285}$

$\frac{6}{7} = 6 \times \frac{1}{7} = 6 \times 0.\overline{142857} = 0.\overline{857142}$

27. Let $p(x) = 3x^3 - 4x^2 + 7x - 5$

$\therefore p(3) = 3(3)^3 - 4(3)^2 + 7(3) - 5$

$= 3(27) – 4(9) + 21 – 5$

$= 81 – 36 + 21 – 5$

$= 61$

Now, $p(x) = 3x^3 - 4x^2 + 7x - 5$

$p(-3) = 3(-3)^3 - 4(-3)^2 + 7(-3) - 5$

$= 3(-27) - 4(9) - 21 - 5$

$= -81 - 36 - 21 - 5$

$= -143$

28. Given: = 122 m, = 22 m and = 120 m

Semi-perimeter of triangle (s)= $\frac{122+22+120}{2} = \frac{264}{2}$ = 132 m Using Heron's Formula,

Area of triangle =$\sqrt{s\,(s-a)\,(s-b)\,(s-c)}$

=$\sqrt{132\,(132-122)\,(132-22)\,(132-120)}$

$= \sqrt{132 \times 10 \times 110 \times 12}$

$= \sqrt{11 \times 12 \times 10 \times 10 \times 11 \times 12}$

= 10 × 11 × 12

= 1320 m^2

∵ Rent for advertisement on wall for 1 year = Rs. 5000 perm^2

∴ Rent for advertisement on wall for 3 months for 1320 m^2; $\frac{5000}{12} \times 3 \times 1320$

= Rs.1650000

Hence rent paid by company = Rs. 16,50,000

OR

In right triangle PSQ,

$PQ^2 = PS^2 + QS^2$ ...[By Pythagoras theorem]

= $(12)^2 + (16)^2$

= 144 + 256 = 400

⇒ PQ = $\sqrt{400}$ = 20 cm

Now, for ΔPQR

a = 20 cm, b = 48 cm, c = 52 cm

∴ s = $\frac{a+b+c}{2}$

$= \frac{20+48+52}{2}$ = 60 cm

∴ Area of ΔPQR

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{60(60-20)(60-48)(60-52)}$

$= \sqrt{60(40)(12)(8)}$

$= \sqrt{(6 \times 10)(4 \times 10)(6 \times 2)(8)}$

$= 6 \times 10 \times 8 = 480 \text{ cm}^2$

Area of Δ PSQ $= \frac{1}{2} \times$ Base $\times$ Altitude

$= \frac{1}{2} \times 16 \times 12 = 96 \text{ cm}^2$

$\therefore$ Area of the shaded portion

= Area of ΔPQR - Area of ΔPSQ

$= 480 - 96 = 384 \text{ cm}^2$

29. 

We are given that ,

Outer radius of the vessel, R = 14 cm.

Inner radius of the vessel, r = 10 cm.

Area of the outer surface = $(2\pi R^2)$ sq units

$= (2\pi \times 14 \times 14) \text{ cm}^2 = (392\pi) \text{ cm}^2$.

Area of the inner surface = $(2\pi r^2)$ sq units

$= (2\pi \times 10 \times 10) \text{ cm}^2 = (200\pi) \text{ cm}^2$.

Area of the ring at the top = $\pi(R^2 - r^2)$ sq units

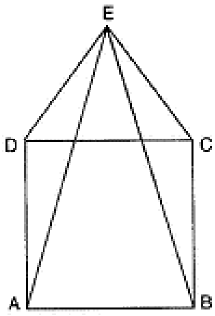
$= \pi[(14)^2 - (10)^2] \text{ cm}^2$

$= \pi(14 + 10)(14 - 10) \text{ cm}^2 = (96\pi) \text{ cm}^2$.

Total area to be painted = $(392\pi + 200\pi + 96\pi) \text{ cm}^2 = (688\pi) \text{ cm}^2$

Cost of painting = ₹$\left(688\pi \times \frac{35}{100}\right)$ = ₹$\left(688 \times \frac{22}{7} \times \frac{35}{100}\right)$

= ₹ $\frac{3784}{5}$ = ₹756.80

30. 

In DEDA and DECB,

DE = CE . . . . [Sides of an equilateral triangle]

AD = BC . . . . [Sides of a square]

$\angle$EDA = $\angle$ECB . . . .[As $\angle$EDC = $\angle$ECD and $\angle$ADC = $\angle$BCD]

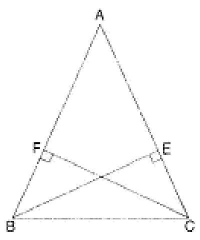
$\angle$EDC + $\angle$ADC = $\angle$ECD + $\angle$BCD . . . .[By addition]

$\Rightarrow \angle$EDA = $\angle$ECB

$\therefore$ DEDA $\cong$DECB . . . [By SAS property]

$\therefore$ AE = BE . . . [c.p.c.t.]

OR



Given: BE and CF are two equal altitudes of a triangle ABC.

To Prove: $\triangle$ABC is isosceles.

Proof : In right $\triangle$BEC and right $\triangle$CFB

side BE = side CF ...[Given]

BC = CB ...[Common]

△BEC ≅ △CFB ...[By RHS rule]

∴ ∠BCE = ∠CBF ...[c.p.c.t.]

∴ AB = AC ...[Sides opposite to equal angles of a triangle are equal]

∴ △ABC is isosceles.

31. y = x

We have, y = x

Let x = 1 : y = 1

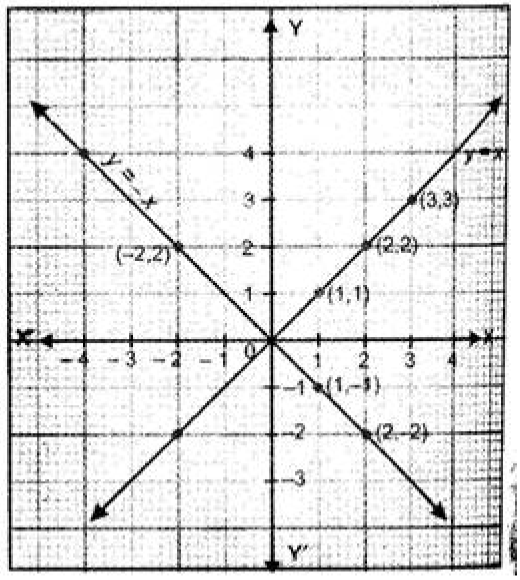
Let x = 2 : y = 2

Let x = 3 : y = 3

Thus, we have the following table :

x	1	2	3
y	1	2	3

By plotting the points (1, 1), (2, 2) and (3, 3) on the graph paper and joining them by a line, we obtain the graph of y = x.



y = -x

We have, y = -x

Let x = 1 : y = -1

Let x = 2 : y = -2

Let x = -2 : y = -(-2) = 2

Thus, we have the following table exhibiting the abscissa and ordinates of the points of the line represented by the equation y = -x.

x	1	2	-2
y	-1	-2	2

Now, plot the points (1, -1), (2, -2) and (-2, 2) and join them by a line to obtain the line represented by the equation y = -x.

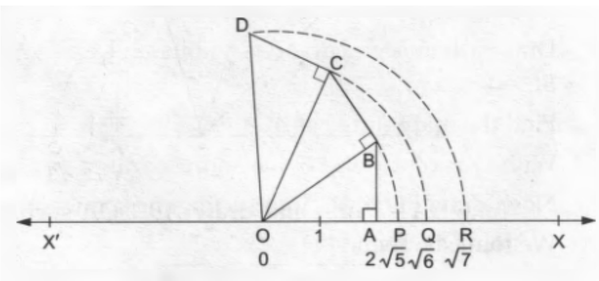
The graphs of the lines y = x and y = -x are shown in figure.

Two lines intersect at O (0, 0).

Section D

32. Draw a horizontal line X'OX, taken as the x-axis.

Take O as the origin to represent 0.



Let OA =2 units and let AB $\perp$OA such that AB = 1 unit

Join OB. Then, by Pythagoras Theorem

$OB = \sqrt{OA^2 + AB^2}$

$= \sqrt{2^2 + 1^2}$

$= \sqrt{5}$

With O as centre and OB as radius, draw an arc, meeting OX at P.

Then, OP = OB = $\sqrt{5}$

Thus, P represents $\sqrt{5}$ or the real line.

Now, draw BC $\perp$OB and set off BC = 1 unit.

Join OC. Then, by Pythagoras Theorem

$OC = \sqrt{OB^2 + BC^2} = \sqrt{(\sqrt{5})^2 + 1^2} = \sqrt{6}$

With O as centre and OC as radius, draw an arc, meeting OX at Q

Then, OQ = OC = $\sqrt{6}$

Thus, Q represents $\sqrt{6}$ on the real line.

Now, draw CD $\perp$ OC and set off CD = 1 unit.

Join OD. Then,by Pythagoras Theorem

$OD = \sqrt{OC^2 + CD^2} = \sqrt{(\sqrt{6})^2 + 1^2} = \sqrt{7}$

With O as centre and OD as radius, draw an arc, meeting OX at R. Then

OR = OD =$\sqrt{7}$

Thus, the points P, Q, R represent the real numbers $\sqrt{5}$, $\sqrt{6}$ and $\sqrt{7}$ respectively

OR

$\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$

$= \frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} \times \frac{\sqrt{10}-\sqrt{3}}{\sqrt{10}-\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} \times \frac{\sqrt{6}-\sqrt{5}}{\sqrt{6}-\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}} \times \frac{\sqrt{15}-3\sqrt{2}}{\sqrt{15}-3\sqrt{2}}$

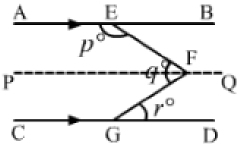
$= \frac{7\sqrt{3}(\sqrt{10}-\sqrt{3})}{10-3} - \frac{2\sqrt{5}(\sqrt{6}-\sqrt{5})}{6-5} - \frac{3\sqrt{2}(\sqrt{15}-3\sqrt{2})}{15-18}$

$= \sqrt{3}(\sqrt{10} - \sqrt{3}) - 2\sqrt{5}(\sqrt{6} - \sqrt{5}) + \sqrt{2}(\sqrt{15} - 3\sqrt{2})$

$= \sqrt{30} - 3 - 2\sqrt{30} + 10 + \sqrt{30} - 6$

$= 2\sqrt{30} - 9 - 2\sqrt{30} + 10 = 1$

33.
- Six points: A,B,C,D,E,F
- Five line segments: $\overline{EG}, \overline{FH}, \overline{EF}, \overline{GH}, \overline{MN}$
- Four rays: $\overrightarrow{EP}, \overrightarrow{GR}, \overrightarrow{GB}, \overrightarrow{HD}$
- Four lines: = $\overleftrightarrow{AB}, \overleftrightarrow{CD}, \overleftrightarrow{PQ}, \overleftrightarrow{RS}$
- Four collinear points: M,E,G,B

34. 

Draw PFQ $\parallel$ AB $\parallel$ CD

Now, PFQ $\parallel$ AB and EF is the transversal.

Then,

$\angle AEF + \angle EFP = 180^\circ$ ...(i)

[Angles on the same side of a transversal line are supplementary]

Also, PFQ $\parallel$ CD.

$\angle PFG = \angle FGD = r^\circ$ [Alternate Angles]

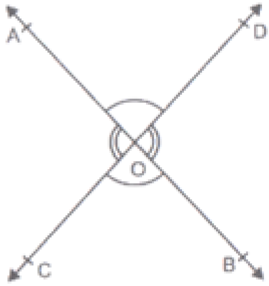
and $\angle EFP = \angle EFG - \angle PFG = q^\circ - r^\circ$

putting the value of $\angle$EFP in equation (i)

we get,

p° + q °- r° = 180° [$\angle$AEF = p°]

OR



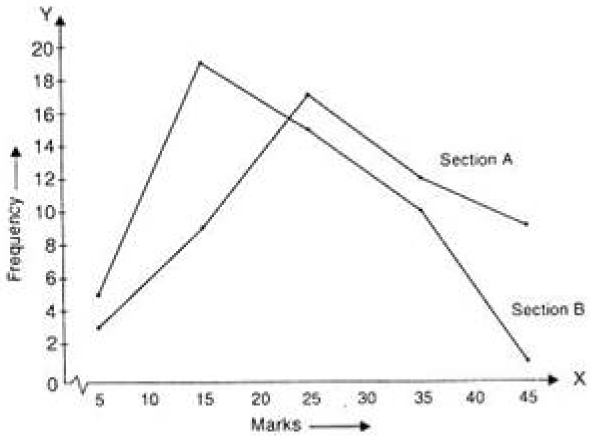
Let two lines AB and CD intersect at point O.
To prove: $\angle AOC = \angle BOD$ (vertically opposite angles)
$\angle AOD = \angle BOC$ (vertically opposite angles)
Proof: (i) Since, ray OA stands on the line CD.
$\Rightarrow \angle AOC + \angle AOD$= 180 °...(1)[Linear pair axiom]
Also, ray OD stands on the line AB.
$\angle AOD + \angle BOD = 180^\circ$ ...(2) [Linear pair axiom]
From equations (1) and (2), we get
$\angle AOC + \angle AOD = \angle AOD + \angle BOD$
$\Rightarrow \angle AOC = \angle BOD$
Hence, proved.
(ii) Since, ray OD stands on the line AB.
$\therefore \angle AOD + \angle BOD = 180^\circ$ ...(3) [Linear pair axiom]
Also, ray OB stands on the line CD.
$\therefore \angle DOB + \angle BOC = 180^\circ$ ...(4) [linear pair axiom]
From equations (3) and (4), we get
$\angle AOD + \angle BOD = \angle BOD + \angle BOC$
$\Rightarrow \angle AOD = \angle BOC$
Hence, proved.

35. For section A

Classes	**Class-Marks**	**Frequency**
0-10	5	3
10-20	15	9
20-30	25	17
30-40	35	12
40-50	45	9

For section B

Classes	**Class-Marks**	**Frequency**
0-10	5	5
10-20	15	19
20-30	25	15
30-40	35	10
40-50	45	1



Section E

36. i. First we will find the curved surface area of the corn cob.

We have, r = 2.1 and h = 20

Let l be the slant height of the conical corn cob. Then,

l = $\sqrt{r^2+h^2} = \sqrt{(2.1)^2+(20)^2}$ = $\sqrt{4.41+400} = \sqrt{404.41}$ = 20.11 cm

$\therefore$ Curved surface area of the corn cub = πrl

= $\frac{22}{7} \times$ 2.1 $\times$ 20.11 cm^2

= 132.726 cm^2 = 132.73 cm^2

ii. The volume of the corn cub

$= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 20$

= 92.4 cm^3

iii. Now

Total number of grains on the corn cob = Curved surface area of the corn cob $\times$ Number of grains of corn on 1 cm^2

Hence, Total number of grains on the corn cob = 132.73 $\times$ 4 = 530.92

So, there would be approximately 531 grains of corn on the cob.

OR

Volume of a corn cub = 92.4 cm^3

Volume of the cartoon = 20 $\times$ 25 $\times$ 20 = 10,000 cm^3

Thus no. of cubs which can be stored in the cartoon

$\frac{10000}{92.4} \approx 108$ cubs

37. i. x - y = 10

2x + 3y = 120

ii. 2x + 3y = 120

iii. x - y = 10 ...(1)

2x + 3y = 120 ...(2)

Multiply equation (1) by 3 and to equation (2)

3x - 3y + 2x + 3y = 30 + 120

$\Rightarrow$ 5x = 150

$\Rightarrow$ x = 30

Hence the number thought by Prateek is 30.

OR

We know that x - y = 10 ...(i) and 2x + 3y = 120 ...(ii)

Put x = 30 in equation (i)

30 - y = 10

$\Rightarrow$ y = 40

Hence number thought by Kevin = 40.

38. i. Since, ABCD is a parallelogram.

$\angle$A + $\angle$D = 180^o (adjacent angles of a quadrilateral are equal)

(4x + 3)^o + (5x + 3)^o = 180^o

$9x = 180^o$

$x = 20$

$\angle D = (5x - 3)^o = 97^o$

$\angle D = \angle B$ (opposite angles of a parallelogram are equal)

Thus, $\angle B = 97^o$

ii. $\angle B = \angle D$ (opposite angles of a parallelogram are equal)

$\Rightarrow 2y = 3y - 6$

$\Rightarrow 2y - 3y = -6$

$\Rightarrow -y = -6$

$\Rightarrow y = 6$

iii. $\angle A = \angle C$ (opposite angles of a parallelogram are equal)

$\Rightarrow 2x - 3 = 4y + 2$

$\Rightarrow 2x = 4y + 5$

$\Rightarrow x = 2y + \frac{5}{2}$

OR

AB = CD

$\Rightarrow 2y - 3 = 5$

$\Rightarrow 2y = 8$

$\Rightarrow y = 4$